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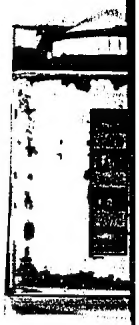

SCIENCE AND TECHNICAL PROGRESS IN USSR NATIONAL ECONOMY

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The most important trend in USSR technological progress is the mechanization of heavy and time-consuming labor, as well as the automation (avtomatizatsiya) of operation and control. Mechanization liberates the individual from heavy physical labor, increases worker productivity, speeds up and makes production easier. Automation completes the process of mechanization. Most production processes are now so complex and require so much greater adherence to system that the individual is no longer able to maintain watch over the numerous control devices and take the prompt steps which ensure the normal rate of these processes. Here automation comes to the aid of the worker. Untiring mechanisms operating at high speed and precision control the most complicated processes; and in the event of deviation from a given process, they exert their effect on the producing aggregate, maintaining the required process (speed, pressure, and temperature). The individual merely supervises the proper operation of the mechanism. Automation changes the nature of labor; the work of the ordinary laborer becomes like that of the engineer and technical worker.

In the first place automation promotes the uninterrupted growth of heavy industry. In the power systems, hydroelectric stations and a number of the processes in thermal electric stations have been automated. Telemechanical equipment ensures control and direction of objects over tens and hundreds of kilometers. In metallurgy the automation of blast and open-hearth furnaces, as well as rolling mills, has significantly improved their operation and greatly increased their productivity. The most rigorous calculations show that automation of metallurgical aggregates results in a 7- to 10-percent increase in productivity and a 6-percent saving of fuel.

In the textile industry a number of spinning, weaving, and manufacturing processes have been automated. "Artificial climate" equipment has been created and incorporated in the food industry and light manufacturing. Automatic signal and bloc systems have increased the traffic handling capacity of railroads and ensured safety of movement.

Several dozen types of semiautomatic and automatic machine tools are notable for their high productivity. For example, modern automatic die-forging machine tools (shtampoval'nyye stanki-avtomaty) perform up to 300 operations per minute. These include placement of the part to be stamped under the die, the actual stamping thereof, and removal of the part. Various multipositional machine tools perform several different operations in metal working (drilling, milling, and planing) at extremely high speed.

Automation yields significant results in a number of branches of technology; however, its development is not measuring up to the needs of the national economy, and in individual instances to practices abroad. In most cases [Soviet] automation has been only partial, i.e., it has been of a kind which involves individual aggregates that are frequently not interconnected. The best results are attained in the case of complex mechanization and automation, in which there is a total reconstruction of all technology, and in which a conversion to a continuous-flow process is effected, with mechanization of auxiliary operations, i.e., conversion to automatic flow lines, automated shops, and automated plants.

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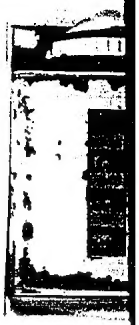

As theoretical calculations which confirm actual practice have shown, the creation of automated continuous-flow processes with the mechanization of primary and auxiliary operations makes possible coordinated operation of aggregates, dispenses with the need for practically all service personnel, increases worker productivity to five to ten times the former level, reduces the requirements for floor space by one half to two thirds, and considerably reduces capital outlays.

Complex automation has taken place in several departments of machine building plants, metal enterprises, and petroleum processing operations, as well as in the chemical, paper, food, and other industries.

There is an imminent need for working out systems of automation for standard (tipovyye) aggregates, especially for the most basic lines of production, and for creating standard (tipovyye) automated plants. The experience of such aggregates and plants will make possible a large-scale transition to the construction of automated plants in various branches of industry.

The immediate task of scholars is to work out a system of automation that will make it possible to turn out basic industrial goods in complex automated factories, plants, mines, and electric power stations, in which the role of the worker will be reduced to supervision of automated mechanisms. Power, irrigation, transport, and other ramified complexes which combine several enterprises and installations will be controlled and directed by telemechanical means. Automatic computors will be able to select the best from among all systems and to maintain that system not only within the individual enterprise but the system as a whole.

To carry out this assignment, scholars must work out more rapidly and in greater depth the theoretical foundations of automation and telemechanics. They must develop a theory of automatic regulation and methods of model-building (modelirovaniye), with the ultimate goal of creating a system of automatic direction (upravleniye) of individual aggregates and intricate complexes which operate with precision and at high speed. The working out of problems in the theory of telmetering (teleizmereniye) and teledirection (teleupravleniye) is no less important.

Where complex mechanization is undertaken, the diversity of the objects under control requires a transition from laboratory methods which are sometimes based on the subjective feelings of the operator himself to objective methods of automatic control that make use of the modern achievements of physics and radiotechnology. As an example of this it is possible to cite control over the level of molten metal in a furnace or bucket by means of electromagnetic or ultrasonic radiation. Apparatus of high quality is being produced in Soviet plants. However, in many instances it is complicated and expensive and requires the use of scarce (defitsitnyye) materials. To have extensive development, automatic apparatus must be simple, inexpensive, and suitable for mass production.

Application of semiconductors, magnetic materials, contactless systems, and the most recent achievements of electronics will make it possible to create new, high-speed components for automation and telemechanics. All of this demands serious scientific research and engineering. Development of production on the basis of scientifically founded and experimentally verified automation ensures the utmost growth of labor productivity, leads to an unimaginable development of socialist technology, and promotes a great increase in the welfare and culture of Soviet workers.

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Electrification is the most important basis of technical progress. During the Fifth Five-Year Plan, construction was started on several hydroelectric stations, representing the last word in technology. These projects included the Tsimlyanskaya, Giumushskaya, Verkne-Svirskaya, Mingechaurskaya, and the first-class Kamskoy, Kakhovskoy, Gor'kovskoy, and Kuibeshevskoy stations, and also the Mironovskaya, Slavyanskaya, Yuzhno-Kuzbasskaya, and Cerepetskaya thermal stations. Construction of the Stalingrad, Irkutsk, and Bratskaya (on the Angara River) is being pushed at high speed. A large number of thermal electric stations have been built.

In the Sixth Five-Year Plan period, annual production of electric power will rise to 320 billion kilowatt-hours. Efficient production and use of such a large amount of electricity requires the creation of power systems and high-voltage networks. Soviet scholars must solve a number of scientific and technical problems relating to efficient and economical transmission of large blocs of electric power in terms of billions of kilowatt-hours over distances of 1,000 kilometers and more.

The substantial increase in electric power resources makes possible the development of many processes, such as ferrous and nonferrous electrometallurgy and alloying, as well as the electrospark, anodemechanical, and electrochemical metal processing, nuclear reaction, and the use of this energy for peaceful purposes. Electricity will penetrate more deeply into industry, agriculture, and into the very existence of the Soviet people.

The January Plenum of the Central Committee CPSU emphasized that extensive mechanization and electrification of agriculture will ease the work of farm labor, increase its productivity, and reduce costs. Experience in the use of electrified machinery made in the USSR shows the technical and economic desirability of a wide use of electric power in agriculture, and the possibility of creating electrified MTS. Complex electrification of farming operations and livestock production on the basis of systems of electrified machinery and advanced Soviet agronomy is now in prospect.

Soviet scholars must develop a system of electrified machinery for basic farming operations and livestock production. They must conduct a thorough study of the relationship between energetics and agricultural techniques. Technical methods for mechanizing labor-consuming processes which are most suited to the natural conditions of particular regions must be worked out.

A number of specific tasks arise in the area of field machinery. Automatic and multimotored drives in complex machines (such as combines, transplanters, and cotton harvesters) should be used extensively. Later, the second problem, that of improving labor organization and individual operating techniques, must be solved.

At the same time that work is being done on the new system of electrified machinery, improvement of existing electric tractor designs should continue. It should be stated frankly that this work has been stymied without justification. This state of affairs should be ended immediately, in order to make possible the level of research and engineering which would enable electric tractors and electric combines to be produced on a large scale.

The working out of a scientific, technical, and economic basis for the use of power resources and the supply of rural areas with electricity are also among the immediate tasks. In addition, an efficient way should be found for uniting power supplied from the great power systems with local power development.

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